• COLORADO RIVER •

AQUEDUCT NEWS

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Vol. V JANUARY 10, 1938 No. 1

Reflecting the early morning sunlight, the aluminum paint on the Gene pumping plant delivery line gives the impression that the 10-foot diameter steel line is made of spun glass.

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AQUEDUCT NEWS
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
306 West Third St.
Los Angeles, California

Published twice monthly in the interest of Field and Office Workers on the Colorado River Aqueduct, and for the information of all other citizens of the Metropolitan Water District.

Vol. V January 10, 1938 No. 1

First Concrete In Copper Basin Dam Placed Dec. 29

Construction of another aqueduct feature was well on its way when on December 29 the first concrete was placed in the Copper Basin dam. Starting on the swing shift on the 29th, the first lift of 18 feet, made up of 612 cu. yds. of concrete, had been placed by January 1.

Although the completed dam will be 210 feet high and will have a crest length of 250 feet, the canyon in which it is placed narrows down so that at the bottom of the foundation the dam is only about 25 feet wide.

Blocking the outlet of Copper Basin on its southern edge, the dam will create a reservoir having a gross capacity of approximately 20,700 acre feet of water. Located six miles west of the Colorado River along the aqueduct, this reservoir will be supplied with water from the Gene pumping plant through the Copper Basin tunnels and will drain by gravity into the Whipple Mt. tunnel.

Being built by the J. F. Shea Co. under the contract which includes the Gene Wash dam, the Copper Basin dam is of the concrete arch type. As described in the NEWS of November 10, 1937, both the Gene Wash and Copper Basin dams are being built with a reinforcing mat of rail steel extending across the foot of the foundation and up the abutments of the arch section. The design of the dam provides for a 5-foot diameter sluiceway which may be used for draining the reservoir below the invert of the Whipple Mt. tunnel.

In addition to the dam itself, the specifications (Schedule 2, Specifications No. 190) call for the construction of an ogee concrete spillway dam which will be 290 feet long, and a reservoir outlet structure at the east portal of the Whipple Mt. tunnel. An estimated total of 19,000 cu. yds. of concrete, and 938,200 lbs. of metal works and reinforcing steel

(*Continued on Page* 8.)

Monument Peak and one of the giant Saguaro cactus in Copper Basin. This basin is one of the few places that this species of cacti is found west of the Colorado River.

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Monrovia Tunnel No. 4, L. E. Dixon Co., Bent Bros., Inc., and Johnson, Inc., W. N. Evans, Supt.

(Canal, Siphon, Conduit)

Schedules Nos. 12 and 12A, Three Companies, Inc., John Will, Supt.

Schedules Nos. 14, 15 and 16, Thompson - Starrett Co., Inc., Rodney Smith, Gen. Supt.; Wiliam Hayes, Excav. Supt.

Schedules Nos. 18, 19 and 20, J. F. Shea Co., Inc., J. G. Shea, Gen. Mgr.; H. F. Rennebohm, Supt.

(Distribution Pipe Line)

Schedules 6P and 7P, J. F. Shea Co., Inc., J. F. Shea, Gen. Mgr.; Ed. H. Shea, Gen. Supt.

Schedule 9P, 10P, 11P, United Concrete Pipe Corp., John Huber, Plant Supt.; Roy Richards, Construction Supt.

Schedules 2B and 2S, Western Pipe & Steel Co., L. L. White, Supt.

Schedules 8C, 9C, 12C, Basich Bros.; Dick Noble, Supt.

J. F. Shea Co., Gilbert J. Shea, Supt.

(Dams)

Cajalco dam, The Griffith Co., Franz Fohl, Gen. Supt.

Parker Dam, J. F. Shea Co., Frank Crowe, Gen. Supt., E. A. Moritz, Constr. Eng., U.S.B.R.

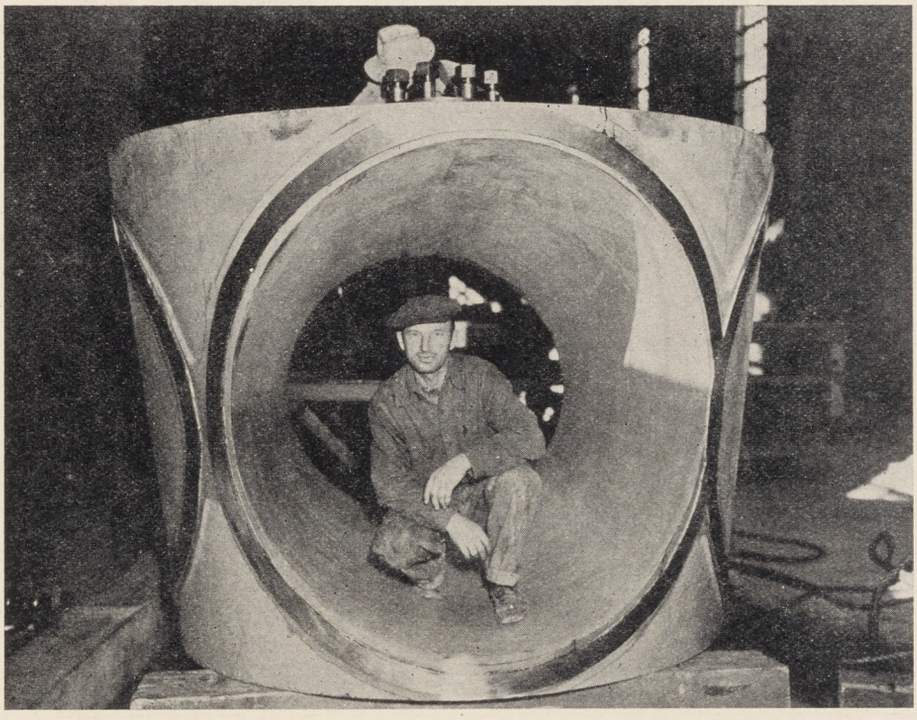
Gene Wash dam, Copper Basin dam, J. F. Shea Co., Frank Crowe, Gen. Supt.

(Pumping Plants)

Intake and Gene, Winston Bros. and Crowell, R. A. Crowell, Supt.; F. T. Hillman, Engr.

Eagle Mountain, L. E. Dixon Co.; J. H. Larkin, Supt.

Hayfield, Dixon and Case; Crawford Strohacker, Supt.



A plug for one of the outlet valves at the Gene pumping plant. Made of cast steel, it is operated by a hydraulic cylinder. The hole through the plug is 50 inches in diameter.

San Jacinto Excavation Progress Totaling 1181 Feet In December Is the Best For 1937

Establishing the best monthly progress for 1937, tunnel crews in the San Jacinto tunnel excavated a total of 1181 feet of main tunnel during the month of December. The average progress amounted to 5.9 feet per shift.

Cabazon crews again turned in an excellent progress report by driving 859 feet during the month. This amounted to better than 28 feet per day for the thirty working days of the period, excavation having been suspended on Christmas Day.

In spite of the heavy water flow which continued in Potrero during the month, the crews working in that heading excavated a total of 308 feet of main tunnel. The average water flow from the west portal of the tunnel amounted to 24,800 gallons per minute. As previously reported, the excavation of the Lawrence adit was completed during December. Work has been continued on equipment installations in the station at the foot of the adit, and by January 8 both legs of the wye to the main tunnel line had been excavated.

In addition to excavation, excellent progress is being made in placing concrete lining in both the Potrero and Cabazon legs of the tunnel. During December a total of 1020 feet of arch was placed, of which 628 feet was in Cabazon and 338 feet in Potrero. By January 1, 1938, approximately 40 per cent of the San Jacinto tunnel lining had been placed. This totaled 27,312 feet of arch and 29,632 feet of invert.

Cabazon lining is now under way in that part of the main tunnel which is paralleled by pioneer tunnel. All excavation traffic is routed through the pioneer so that the lining work can proceed without interruption.

On the Potrero side, recent lining operations have been conducted between the shaft and the first wye leading into the pioneer tunnel. Invert, with a high curb, was placed first, traffic being carried over a bridge built above the floor of the tunnel. By the use of the high curb, and special forms, arch lining is now being placed in this section, and at the same time tunnel excavation traffic is able to operate between the shaft and the face. The completed invert carries water flowing from the main tunnel and pioneer headings.

When this section totaling 3040 feet is completed, lining will be started in the section of the tunnel which is paralleled by the pioneer and which is approximately a mile in length.

Eagle Mt. Delivery Line Started

Installation of the steel delivery line at the Eagle Mt. pumping plant was started in December, and by January 1, 1938, the contractor had placed the three branch delivery lines and the first section of the 10-foot diameter pipe.

Work on the other pumping plants is in varying stages of completion with force account installation of equipment under way at Iron Mt., Intake, and Gene Wash plants. All pumps have been placed at Iron Mountain and the mechanical assembly of one of the electric motors has been completed.

The third General Electric synchronous motor for the Gene Wash plant has been received and installation of pumps and equipment is proceeding at that plant. Placing of concrete in plant buildings by contract forces is going ahead at Intake, Eagle Mt. and Hayfield plants. The initial development of the aqueduct provides for the installation of three 200 cubic-foot-per-second capacity pumps at each of the five plants.

All contract work at Iron Mt., built by Wood and Bevanda, has been completed. Contract work at the Intake and Gene Wash plants is being done by Winston Bros. and Crowell. The Eagle Mt. plant is under contract to the L. E. Dixon Co., and Dixon and Case are building the Hayfield plant.

Installation of all pumping equipment is by District forces under the direction of superintendents T. T. Walsh, B. H. Martin, and R. C. Booth.

AWARDS MADE FOR 62,300 TONS OF AGGREGATES

A contract for furnishing 62,300 tons of concrete aggregates for lining 8,000 feet of the San Jacinto tunnel was awarded by the Board of Directors on December 31 to the San Gorgonio Rock Products Company of Banning. The bidder's price, which was low, amounts to $74,263 at the batching plant.

At the same meeting, the Board awarded contracts for electric motor starters and electric power cable. General Electric Co. of Los Angeles will furnish ten electric motor starters for aqueduct pumping plants under Specifications No. 257 at a total cost to the District of $12,010, and Associated Wholesale Electric Co. of Los Angeles will furnish 25,000 feet of 3-conductor size 2/0 armored cable for use in the San Jacinto tunnel for $26,740, f.o.b. Banning.

TUNNELS

December 1 to December 31, 1937

TUNNEL EXCAVATION (MILES)

	Completed	Remaining
Aqueduct	88.96	3.15
Distribution	16.20	.0
Total	105.16	3.15

TUNNEL LINING (MILES)

	Completed	Remaining
Aqueduct	84.33	7.78
Distribution	14.00	2.15
Total	98.33	9.93

AQUEDUCT

CONTRACTOR	TUNNEL	LENGTH IN FEET	EXCAVATION IN FEET: NUMBER OF SHIFTS	AVERAGE PER SHIFT	THIS PERIOD	TOTAL TO DATE	REMAINING	LINING IN FEET: ARCH OR INVERT	NUMBER OF SHIFTS	AVERAGE PER SHIFT	THIS PERIOD	TOTAL TO DATE	REMAINING
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA	SAN JACINTO	(68,843)	(198)		(1,181)	(52,199)	(16,644)				*(816)	(27,776)	(41,067)
	Cabazon Shaft to East Portal	8,880		Completed		8,880	0	Arch	0	0	0	8,484	396
								Invert	0	0	0	8,484	396
	Cabazon to Lawrence	26,809	90	9.5	859	19,272	7,533	Arch	14	48.7	682	3,537	23,272
	Lawrence to Cabazon		9	0.4	4	4		Invert	0	0	0	2,855	23,954
	Lawrence to Potrero	17,672	9	1.1	10	10	9,111						
	Potrero to Lawrence		90	3.4	308	8,551		Arch	12	28.2	338	338	17,334
								Invert	0	0	0	2,811	14,861
	Potrero Shaft to West Portal	15,482		Completed		15,482	0	Arch	0	0	0	14,953	529
								Invert	0	0	0	15,482	0
	Lawrence Adit	5.664	51	1.1	57	5,664	0						
	Cabazon Pioneer			Suspended		7,274							
	Potrero Pioneer			Suspended		5,571							
	TOTALS Ft.	68,843	198	5.96	1,181	52,199	16,644	Arch	26	3.9	1,020	27,312	41,531
	Miles	(13.04)			(0.22)	(9.89)	(3.15)	Invert	0	0	0	29,632	39,211

DISTRIBUTION

CONTRACTOR	TUNNEL	LENGTH IN FEET	EXCAVATION IN FEET: NUMBER OF SHIFTS	AVERAGE PER SHIFT	THIS PERIOD	TOTAL TO DATE	REMAINING	LINING IN FEET: ARCH OR INVERT	NUMBER OF SHIFTS	AVERAGE PER SHIFT	THIS PERIOD	TOTAL TO DATE	REMAINING
GRIFFITH CO.	CAJALCO OUTLET	2,368		Completed		2,368	0				0	2,341	0
WEST CONSTRUCTION CO.	MONROVIA NO. 1 (FromW.P.)	7,868		Completed		7,868	0			Completed		7,796	0
	MONROVIA NO. 2 (FromJct.1)	940		Completed		940	0			Completed		856	0
	MONROVIA NO. 3	(32,105)		Completed		(32,105)	(0)				*(3,020)	(22,552)	(9,543)
	East from Adit	11,340				11,340	0	Full Sec.	4	18.7	75	12,279	
	West from Adit					5,913		Invert			0	19,352	464
	From West Portal	20,765				14,851	0	Arch	71	52.0	3,682	8,004	11,812
DIXON, BENT BROS. & JOHNSON	MONROVIA NO. 4 (FromW.P.)	8,133		Completed		8,133	0		15	11.1	867	6,308	1,825
	SAN RAFAEL No.1 (FromW.P.)	4,047		Completed		4,047	0			Completed		4,028	0
	SAN RAFAEL No. 2 (FromE.P.)	5,669		Completed		5,669	0			Completed		5,661	0
	TOTALS Ft.	61,130				61,130	0	Full Section	90	43.19	3,887	49,542	11,368
	Miles	(11.58)				(11.58)	0				(0.73)	(9.38)	(2.15)

*Invert considered to equal 0.2 and arch 0.8 of completed section.

Miscellaneous Construction

December 12, 1937, to January 1, 1938

AQUEDUCT PUMPING PLANTS AND APPURTENANT WORKS

CONTRACTOR	FEATURES	EXCAVATION—Cu. Yds.: Est. Quan.	Period	To Date	%	CONCRETE—Cu. Yds.: Est. Quan.	Period	To Date	%	STEEL—Tons: Est. Quan.	Period	To Date	%
WINSTON BROS. CO. &	Intake Plant	114,370	0	114,370	100	22,800	427	22,443	98	1,788	7.9	1,684.6	94
WILLIAM C. CROWELL	Gene Plant	175,092	0	175,092	100	23,222	135	23,002	99	2,863	104.5	2,822.2	98
WOOD AND BEVANDA	Iron Mt. Plant	354,909	0	354,909	100	22,942	0	22,942	100	1,796	0	1,795.7	100
L. E. DIXON CO.	Eagle Plant	269,624	3,800	264,197	98	28,113	783	26,318	94	2,264	31.8	1,713.6	76
L. E. Dixon & Case Const. Co.	Hayfield Plant	354,684	0	350,721	99	32,266	2,037	26,772	82	2,490	139.4	1,655.7	66
	TOTALS		3,800	1,259,289			3,382	121,477			283.6	9,671.8	

PARKER RESERVOIR—SIX COMPANIES, INC.

FEATURES	Est. Quan.	Period	To Date	Percent
Diversion Tunnels—Excav.	3,463 Ft.	0	3,463	100
Diversion Tunnels—Concrete	3,363 Ft.	0	3,363	100
Cofferdams—Excav.	227,582 C.Y.	0	227,582	100
Cofferdams—Fill	464,890 C.Y.	0	464,890	100
Outlet Works—Excav.	220,000 C.Y.	0	207,176	94
Outlet Works—Concrete	5,000 C.Y.	0	3,735	75
Dam—Excavation	1,510,200 C.Y.	0	1,508,105	99
Dam—Concrete	297,900 C.Y.	15,599	253,601	85
Power House—Excav.	58,000 C.Y.	0	56,700	98
Power House—Concrete	14,000 C.Y.	438	9,400	67

CAJALCO RESERVOIR—GRIFFITH COMPANY

FEATURES	Est. Quan.	Period	To Date	Percent
Diversion Tunnel	2,000 Ft.	0	2,000	100
Outlet App. Channel—Exc.	199,300 C.Y.	0	199,300	100
Outlet Tower—Concrete	3,290 C.Y.	80	3,250	99
Dam & Spillway—Exc.	693,800 C.Y.	0	689,100	99
Dam—Fill	3,140,000 C.Y.	0	3,124,000	99
Dam & Spillway—Concrete	26,820 C.Y.	1,655	26,820	100
Dike—Excavation	13,950 C.Y.	0	13,950	100
Dike—Fill	3,862,520 C.Y.	6,400	3,861,940	100
Dike—Concrete	44,100 C.Y.	0	44,095	99

GENE WASH RESERVOIR—J. F. SHEA CO., INC.

FEATURES	Est. Quan.	Period	To Date	Percent
Dam—Excavation	7,500	0	7,500	100
Dam—Concrete	13,365 C.Y.	3,943	10,164	76
Spillway—Excavation	4,762 C.Y.	0	4,762	100
Spillway—Concrete	4,800 C.Y.	104	4,814	99
Dike—Excavation	4,000 C.Y.	0	1,840	46
Dike—Fill	10,500 C.Y.			
Dike—Concrete	1,200 C.Y.	0	200	17

COPPER BASIN RESERVOIR—J. F. SHEA CO., INC.

FEATURES	Est. Quan.	Period	To Date	Percent
Dam—Excavation	8,700 C.Y.	400	8,700	100
Dam—Concrete	16,275 C.Y.	612	612	4
Spillway—Excavation	6,700 C.Y.	756	6,000	89
Spillway—Concrete	1,000 C.Y.			
Outlet Works—Excavation	Lump Sum	5%	5%	5
Gate House Superstructure				
Clearing Reservoir Site	427 Ac.	0	75%	75

TION PROGRESS

CANAL, CONDUIT, SIPHON & PIPE LINES

December 12, 1937, to January 1, 1938

CANAL, CONDUIT AND SIPHON (MILES)

	Completed	Remaining
Excavation	144.12	1.48
Concrete	141.28	3.27
Back Fill	76.26	4.58

DISTRIBUTION PIPE LINE (MILES)

	Completed	Remaining
Excavation	46.08	17.61
Concrete	46.05	17.64
Back Fill	46.03	17.66

AQUEDUCT

SCHED. NO.	CONTRACTOR	FEATURES	Length In Feet	EXCAVATION—Feet			CONCRETE—Feet			BACKFILL—Feet		
				Period	To Date	Remain'g	Period	To Date	Remain'g	Period	To Date	Remain'g
14	THOMPSON-STARRETT CO.	Conduit and Siphons	32,366	0	32,366	0	0	32,366	0	0	32,366	0
15		Conduit and Siphons	35,849	0	35,849	0	0	35,849	0	0	35,849	0
16		Conduit and Siphons	19,281	966	14,190	5,091	815	12,786	6,495	1,622	10,806	8,475
18	J. F. SHEA CO., INC.	Conduit and Siphons	27,537	0	27,537	0	0	27,537	0	0	27,327	210
19	J. F. SHEA CO., INC.	Conduit and Siphons	37,105	1,646	34,435	2,670	3,419	27,086	10,019	6,450	22,659	14,446
20		Siphons	18,618	0	18,618	0	0	18,618	0	0	18,618	0
20 A & B	M. W. D.—FORCE ACCT.	Siphons	752	0	705	47	0	0	752	0	0	752
3	WINSTON BROS. CO. & WILLIAM C. CROWELL	Siphon (Gene Inlet)	1,877	0	1,877	0	0	1,872	5	0	1,478	320
4		Siphon (Copper Basin)	450	0	450	0	0	450	0	0	0	0
	TOTALS		173,835	2,612	166,027	7,808	4,234	156,564	17,271	8,072	149,103	24,203

DISTRIBUTION PIPE LINES

6-P	J. F. SHEA CO., Inc.	Precast Concrete Pipe	27,294	0	27,294	0	0	27,294	0	0	27,294	0
7-P			30,044	166	30,044	0	166	30,044	0	1,703	30,044	0
9-P	UNITED CONC. PIPE CORP.	Precast Concrete Pipe	8,697	0	8,388	309	0	8,388	309	0	8,388	309
10-P			10,517	0	10,517	0	0	10,517	0	0	10,517	0
11-P			4,105	0	4,105	0	0	4,105	0	0	4,105	0
8C-9C-12C	BASICH BROTHERS	Cast-in-Place Conc. Pipe	1,656	0	708	948	15	566	1,090	97	480	1,176
21SC	J. F. SHEA CO., Inc.	Precast Concrete Pipe	28,930	0	0	28,930	0	0	28,930	0	0	28,930
22SC			28,310	0	0	28,310	0	0	28,310	0	0	28,310
23SC			34,470	0	0	34,470	0	0	34,470	0	0	34,470
	TOTALS		174,023	166	81,056	92,967	181	80,914	93,109	1,800	80,828	93,195

COMPLETED FEATURES

TUNNELS

	CONTRACTOR	TUNNEL	Length in Miles	Work Started	Work Completed
AQUEDUCT	MORRISON-KNUDSEN CO.	Mecca Pass, No. 1, 2 & 3	1.13	7-17-33	2-10-35
	WEST CONSTRUCTION CO.	Whitewater Nos. 1 & 2	1.94	7-18-33	4-15-35
	SHOFNER & GORDON	Hayfield No. 2	1.03	7-8-33	7-27-35
	HAMILTON & GLEASON	Bernasconi	1.18	4-19-33	11-21-35
	J. F. SHEA CO., INC.	Cottonwood	3.81	6-14-33	12-29-35
	HUNKIN-CONKEY CON. CO.	Hayfield No. 1	1.84	10-21-33	1-9-36
	DIXON & BENT BROS.	W. Eagle—West Portion	2.02	9-8-33	3-12-36
	DRAVO CONTRACTING CO.	Valverde	7.20	6-7-33	10-18-36
	WALSH CONSTRUCTION CO.	Colorado River	1.04	3-2-34	1-29-36
	WALSH CONSTRUCTION CO.	Copper Basin Nos. 1 & 2	2.32	10-4-33	2-20-36
	WALSH CONSTRUCTION CO.	Whipple Mountain	6.11	8-25-33	1-26-37
	UTAH CONSTRUCTION CO.	IronMt.—West Portion	3.07	5-15-33	10-23-36
	WINSTON BROS. CO.	Iron Mt.—East Portion	4.48	8-9-33	10-30-36
	METRO. WATER DIST.	1000 Palms No. 1	3.04	1-25-33	1-7-37
	" " "	1000 Palms No. 2	0.73	2-24-33	12-19-35
	" " "	Wide Canyon No. 1	2.71	3-31-33	2-11-37
	" " "	Wide Canyon No. 2	0.16	3-24-33	2-12-37
	" " "	Seven Palms	3.17	4-27-33	2-2-37
	" " "	Long Canyon	2.90	3-6-34	12-31-36
	" " "	Blind Canyon	1.29	3-22-34	12-3-36
	" " "	Morongo No. 1	1.08	4-21-34	1-20-37
	" " "	Morongo No. 2	0.36	12-29-34	1-5-37
	BRODERICK & GORDON	West Eagle Mt.—E. Portion	3.00	2-8-34	5-6-37
	WINSTON BROS.	Coxcomb	3.37	9-15-33	4-26-37
	METRO. WATER DIST.	East Coachella	18.30	1-25-33	5-8-37
	BRODERICK & GORDON	East Eagle Mt.	1.79	6-8-34	7-23-37
		TOTALS	79.07		
DISTRIBUTION	J. F. SHEA CO., INC.	Sierra Madre	1.27	9-1-35	10-31-36
	DIXON, BENT BROS. & JOHNSON	Pasadena Extension	1.05	10-5-35	11-24-36
	DIXON, BENT BROS. & JOHNSON	Pasadena	2.30	2-11-35	4-29-37
		TOTALS	4.62		

CANAL, CONDUIT, SIPHON, AND PIPE LINES

	CONTRACTOR	FEATURE AND NAME OR SCHEDULE	Length in Miles	Work Started	Work Completed
AQUEDUCT	UNITED CONCRETE PIPE CORP.	Little Morongo Siphon	0.13	2-27-34	8-20-34
	METRO. WATER DIS.	Fan Hill Conduit and Siphon	0.32	10-21-33	11-19-34
	MORRISON-KNUDSEN CO.	Sch. No. 18-J, Big Morongo and San Andreas Siphon	1.86	2-12-35	9-16-36
	GRIFFITH COMPANY	Sch. No. 20-C, 21, 22, 23 & 23-A	12.79	1-5-35	10-13-36
	JAHN & BRESSI CONST. CO.	Sch. No. 5, Canal and Siphons	10.15	12-18-34	11-17-36
	JAHN & BRESSI CONST. CO.	Sch. No. 4, Canal and Siphons	10.08	6-6-35	3-18-37
	UTAH CONSTRUCTION CO.	Sch. No. 9, Canal, Conduit & Sip.	8.97	12-12-34	5-15-37
	BARRETT-HILP & MACCO CORP.	Sch. No. 2, 3, 7, Canal, Con. & Sip.	18.71	12-3-34	5-25-37
	METRO. WATER DIST.	Sch. No. 17, Conduit and Siphons	4.16	9-9-35	6-15-37
	AQUEDUCT CONST. CO	Sch. No. 1,10,11,13 Canal, Con. & S.	26.99	1-24-35	6-24-37
	WOOD & BEVANDA	Sch. No. 6, 8, Canal & Siphons	12.28	11-27-34	7-28-37
	THREE COMPANIES, INC.	Sch. No. 12, Conduit & Siphons	6.24	1-8-35	11-6-37
		TOTALS	112.68		
DISTRIBUTION	UNITED CONCRETE PIPE CORP.	Sch. No. 8P, Precast Concrete Pipe	4.65	2-21-36	3-20-37
	WESTERN PIPE & STEEL CO.	Sch. No. 2S, 2B, Welded Steel Pipe	10.33	4-8-36	11-24-37
	AMER. CONC. & STEEL PIPE CO.	Sch. No. 1, 3, 4, 5, Precast Conc. Pipe	15.75	2-20-36	12-23-37
		TOTALS	30.73		

Aqueduct Operating Features Attract Much Interest

With the construction of the aqueduct nearing completion, many people are becoming interested in the operating features of the system. Following up the note regarding aqueduct velocity that appeared in the last issue of the NEWS there have been a number of requests as to velocities in the distributing system and various sections of the main aqueduct.

The estimated average velocity of 4¼ miles per hour on the main aqueduct is based on full capacity operation. Assuming that the drop of water in question does not tarry along the way in any of the reservoirs it would require about 57 hours for it to go from the intake to the terminal reservoir at Cajalco. Velocity of the distributing pipe lines is slightly faster than the main aqueduct, being approximately 4½ miles per hour. It is about ninety miles, via the aqueduct, from Cajalco to Long Beach, and will require twenty hours for water to make this part of the journey. Long Beach consumers will, therefore, get aqueduct water a little over three days from the time it leaves the Colorado River (again assuming that it does not lay over in the operating and pumping plant reservoirs).

Each of the various types of aqueduct sections is designed to carry water at predetermined velocities. The fastest velocities are in the 16-foot diameter tunnels where the water will travel at a rate of 8.4 feet per second. (You'll have to do your own multiplying to get this into miles per hour).

The typical canal sections will carry water at a velocity of 4.45 feet per second. An exception to this is a narrow canal section about 2000 feet long and located in a rock cut near the west portal of the Iron Mt. tunnel. The grade in this canal has been increased so that the water will flow at the rate of 5.47 feet per second.

Water will flow at an estimated speed of 7.18 feet per second in the fifty-five miles of concrete conduits on the main aqueduct. Because of the many different designs that make up the 29 miles of main aqueduct siphons, the velocities range from 7.98 f.p.s. in the 16-foot diameter barrels to 5.65 f.p.s. in the box siphons.

Water in the 10-foot diameter steel delivery lines out of the pumping plants will be boosted up hill at a speed of 7.6 feet per second.

Historical Records Reveal Value of Canal Machines

During the peak of construction activities on the main aqueduct, there were so many types of construction work going at one time that the average layman or the average aqueducker had no opportunity to get detailed information about the interesting features of each job. However, part of each division engineer's work is to prepare a detailed history of each contract or force account job that was completed under his direction. Many of these histories have now been prepared and in them are revealed items that escaped general notice while the jobs themselves were under way.

Probably one of the most interesting contributions that was developed in construction methods was the use of the canal trimming and paving machines. The results obtained by the use of these unique machines were generally better, and far more economical than could have been obtained by hand or semi-mechanical methods.

Canal schedules were constructed by Barrett, Hilp & Macco, Jahn & Bressi, Wood & Bevanda, Utah Const. Co., and Aqueduct Const. Co.

Clyde Wood, of Wood & Bevanda, was the first to develop these machines, adaptations of which were later used on all of the canal schedules. The historical record covering Schedule 8 states:

"At the time his firm was awarded the contract for the canal construction, Mr. Wood, realizing the advantage of preparing the subgrade and placing the concrete by mechanical means, set to work designing machines with which to trim the subgrade and place the concrete as a monolithic slab. These machines were later fabricated in his own shops and assembled in place on the job."

Wood & Bevanda's machines were later rented by one contractor, but the other contractors used adaptations of the trimmer and paver. All machines, however, achieved the same result, which was to trim the canal slopes as left by the draglines to the "neat" line required for concreting, and to place the canal lining in a single monolithic slab.

Based on the amount of concrete actually used to line the canals, the records show that the trimming machines excavated the canal surfaces to within ⅛-inch of the theoretical dimension required.

In point of speed with which the trimming machines completed the excavation of the canals, the historical reports also show the improvement of mechanical methods over other ways of trimming. On one of the schedules where hand trimming was used, it required a crew of from 20 to 25 men, working one shift per day, to complete 150 feet of canal. A canal trimming machine in the same type of formation covered from 500 to 600 feet of canal in an 8-hour shift.

(*To be continued.*)

AQUEDUCT MAP AQUEDUCT NEWS INDEX

Folded in this issue of the NEWS is the latest edition of the General Map of the Colorado River Aqueduct. Revised as of January, 1938, this plan and profile of the aqueduct shows all features of the aqueduct, roads and power lines, contractor's names and the schedules which they built, and division boundaries. The original of this map and the revised edition was drawn by V. J. Meyer of the Los Angeles office of the Distribution Division.

It is believed that this map will be of especial use to those who keep AQUEDUCT NEWS files. The 1937 Index of the NEWS is now available, and whenever possible this index lists articles and pictures in connection with the aqueduct feature to which they refer. The 1937 Index, covering Volume IV, Issue Nos. 1 to 24 incl., may be obtained from the Los Angeles headquarters of the District.

This is the reverse view of the picture shown on the cover. Taken from the east portal of Copper Basin tunnel No. 1, it looks down on the Gene Wash pumping plant. The height of the lift can be gauged by noting the size of the automobile at the extreme lower right.

NEWS FROM FIELD AND OFFICE

The last trip of the Cajalco "candy wagon" which supplied Cajalcoites with the necessities of life during the reservoir construction job. Second from the left is the owner and disher-outer, A. W. "Ptomaine" Eddy.

The Banning socialites wish to announce in LARGE FACE TYPE that ALL aqueduckers are requested to reserve the evening of Saturday, February 19, 1938, for a gala dinner and dance to be sponsored by the Field and to be held somewhere in the vicinity of Riverside. This date has been picked because it is a shut-down weekend for all divisions except No. 4, and it is understood that special arrangements will be made for those on Division 4 who plan to attend the party. The exact location has not yet been decided, and until that is done, the price can not be announced. However, all information will be available in the near future and will be announced via bulletin boards and the next issue of the NEWS. The party committee, of which there is no chairman, consists of Dick Stephens, Fred Carlton, A. E. McKenzie, Lewis Tuthill, Jim Henry, and Rhodes Rule. Again, you are ALL requested to save the date—February 19, 1938.

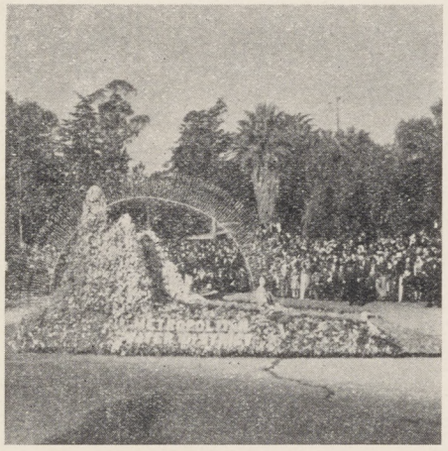
* * *

H. D. Raymond of the Los Angeles office of the Electrical-Mechanical Division has resigned from the District to take a position with the United States Engineers working on L. A. County Flood Control.

Aqueduct Temperatures
Dec. 15 to Dec. 31, 1937

	Max.	Min.
Div. 1	75°	41°
Div. 2	72°	35°
Div. 3	75°	35°
Div. 4 (discontinued)		
Divs. 5 and 6	70°	33°

The Long Beach Press-Telegram carries an announcement of the engagement of Patricia McWhinney and Charles F. Van de Water. Charles is one of the bright and handsome young lads in the Electrical-Mechanical Division. The wedding will be in March, although the exact date has not been set.



The M. W. D. float in the New Year's Day Tournament of Roses Parade at Pasadena. Titled "The King of the Golden River," the float depicted a famous story by the same name written by John Ruskin.

E. A. Moritz, Construction Engineer for the U.S.B.R. at Parker Dam, has been transferred to the Marshall Ford Dam, near Austin, Texas, on which work has just recently been started. He will be replaced by Howard P. Bunger of the Bureau of Reclamation.

* * *

Charles A. McGill, chainman on the Distribution Division has been transferred to field engineering work at Division 1.

* * *

Following eleven years of engineering work on the Colorado River Aqueduct Project, E. K. Walker resigned from the District's service on January 10th to accept employment with the United States Indian Irrigation Service, with offices in Los Angeles.

General Storekeeper Charles J. Fox, formerly in the Division 4 general stores, has been transferred to the Banning Salvage section.

* * *

Neal Smith, who for many years has been one of the standbys of the Banning engineering office is now an engineer on the Division 3 pumping plants (Eagle Mt. and Hayfield).

* * *

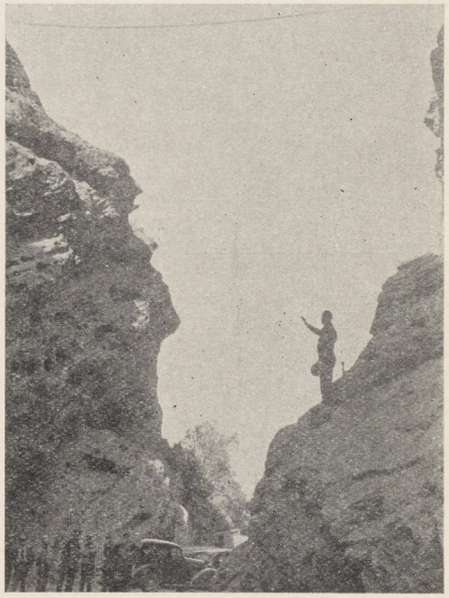
Jack Schweer, who was general foreman at Iron Mt. in charge of the installation of equipment at the pumping plant, is now general foreman at the Intake and Gene Wash pumping plants.

* * *

Beginning January 10, Fox West Coast Theatres throughout Southern California will be showing newsreel motion pictures of the latest construction work at Parker Dam. For those who may wish to inquire from theatre managers as to showing dates, the newsreel is Issue No. 31.

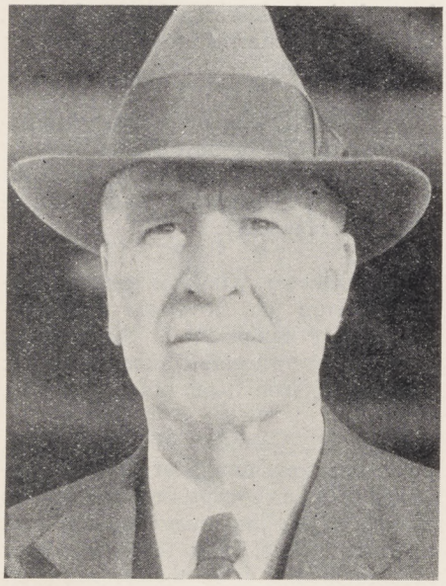
* * *

An announcement missed in the last issue of the NEWS was that of the birth on December 14, of Douglas McKinley. The young man's father is Malcom McKinley, general clerk at Lawrence adit.



The principal object of this picture is to illustrate the face on the rock at the entrance to the narrow canyon in which the Copper Basin dam is located. Note the upper left skyline. Presiding over the affair and giving it his benediction is "Reverend" Rufe Fee of the L. A. garage. No satisfactory explanation for the pose has been offered as yet.

James Munn Resigns From Water District



James Munn Retires from Active Service

Mr. James Munn, General Superintendent of Construction of the Water District, resigned on January 1, 1938, to retire from active engineering work.

Mr. Munn is regarded as "The Grand Old Man" of the Water District and is well known as a construction engineer throughout national engineering circles. Born in Scotland, he has had over forty years of engineering experience, most of which has been in responsible charge of large projects.

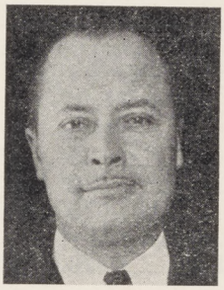
From 1891 to 1908 he was in private practice in general construction and engineering contracting. He went with the United States Reclamation Service in 1909 and was with that service until 1924. During that period he served as superintendent of construction on many projects and from 1917 until 1924 he was in charge of all cost keeping and engineering administrative work for the Reclamation Service.

In 1924, Mr. Munn went to Oakland, Calif., to be in general charge of the construction of the Mokelumne Water Supply Project, East Bay Municipal Utility District. He was Chief of Construction of the Major Dams Divisions of the Los Angeles Water Department from 1929 to 1930, and since that time he has been General Construction Superintendent for the Metropolitan Water District.

His many years of engineering experience have been of great value in connection with the design and construction of the aqueduct, and his services have been used on all phases of the work. All bond issue estimates and other cost estimates have been prepared under his direction.

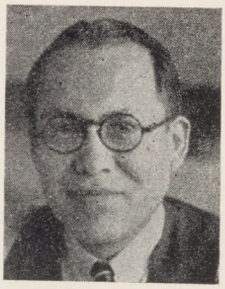
Although he will not be directly associated with the District, his many friends on the aqueduct will be glad to know that he plans to continue his residence in Los Angeles.

Who's Who On the Aqueduct



V. P. Pentegoff

J. C. Swinford



A. H. Gardner

V. P. PENTEGOFF
Assistant Engineer, Distribution Division, Metropolitan Water District.

Born in Russia, June 24, 1899 . . . Attended grammar and high school in Shadrinsk, Siberia . . . Graduated from Colorado School of Mines, Golden, Colorado, in 1928 with a degree in Geological Engineering . . . During summer vacations while in college worked as a driller for Portland Mining Co. at Victor, Colorado, as a tooldresser for the Midwest Refining Co., Midwest, Wyoming, and as a rodman for the United States Geological Survey . . . Worked for Shell Oil Co. at Signal Hill, Calif., in 1928 on pipe line construction and 1928-1930 was with Radiore Company of Los Angeles as Geological Engineer and chief of field crews . . . Has been with M.W.D. since December, 1931 . . . Worked out of Banning Engineering office, and as inspector and geologist on main aqueduct tunnels . . . Later transferred to Distribution Division on geology and tunnel construction . . . Is married . . . Known to everyone as "Wally" although first name is Valdimir.

J. C. SWINFORD
Senior Bookkeeper, Accounting Division, Metropolitan Water District.

Born in Dallas, Texas, February 8, 1902, and attended school in that city . . . 1920-1927 with M. K. & T. Railroad in Accounting office, Dallas . . . 1927-1932 with Proctor & Gamble ManufacturingCompany . . . During this period he worked in three of that company's plants as cashier and manager of accounting departments . . . Has been with M.W.D. since February, 1933 . . . Has been involved in the 200,000 invoices referred to in NEWS of December 25, 1937 . . . Hobby is golf, although he partakes of most types of athletics . . . Nickname "Jimmy."

A. H. GARDNER
Senior Draftsman, Design Division, Metropolitan Water District.

Born in Durango, Colorado, April 27, 1903 . . . Is a Navajo Indian . . . Attended Sherman Institute and Polytechnic High School in Riverside, California, and went to Occidental College . . . 1924-1925, rodman, chainman, and instrumentman for V. F. Morse, San Fernando, California . . . 1925-1929 in Sanitary Sewer Division, Engineering Bureau, City of Los Angeles, draftsman and design work . . . Has been on Colorado River Aqueduct project since August, 1929, on drafting and design of hydraulic structures . . . Is a past director of the California Indian Rights Association . . . Married and has two children . . . Nickname "Al."

FIRST CONCRETE PLACED IN COPPER BASIN DAM

(*Continued from Page* 1.)

will be required for the three structures.

Work on both the Copper Basin and Gene Wash dams is under the supervision of Division Engineer W. E. Whittier. John Bartlett is Senior Inspector on the job for the District, and John Sawyer is Superintendent for the contractor.

SAGUARO CACTUS

Dick Stephens, Office Engineer at Banning, has done some research on the Saguaro Cactus (see picture page 2) and finds that the principal reason that it is not ordinarily found west of the Colorado River is because of the fact that it requires more rain in the summer than is available in the California desert. In the Arizona desert, where it is found in large numbers, the average rainfall is 12 inches per year, most of which is in the hot summer months. The California desert west of the river averages only 4 inches per year.